

ATTACHMENT D

WETLAND MITIGATION PROPOSAL APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT FREEPORT LNG TERMINAL PROJECT BRAZORIA COUNTY, TEXAS

This document represents the Wetland Mitigation Plan for the Freeport Liquid Natural Gas (LNG) Facility in Brazoria County, Texas (Figure 1). It is revised from and replaces in entirety the plan dated August 2003. See Attachment A (of the Section 404/Section 10 Permit Application Package) for a full description of the proposal and impact on wetlands.

In mitigating wetlands, Freeport LNG Development, L.P. (Freeport LNG) has sought first to avoid and second to reduce wetland impacts. Freeport LNG is committed to mitigating for unavoidable wetland impacts resulting from construction of this facility.

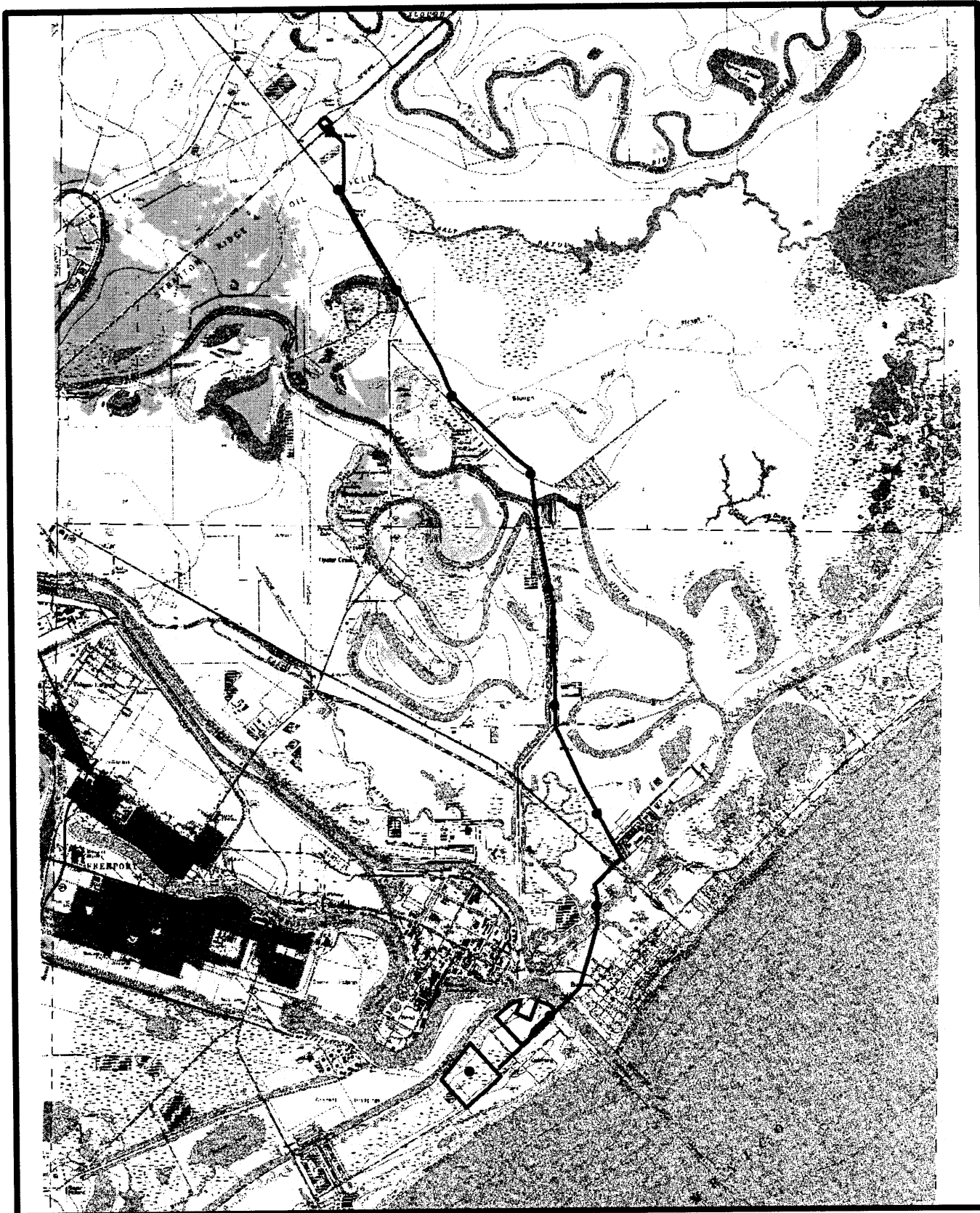
Upon implementation of this Wetland Mitigation Plan (WMP), a result of no net loss of wetlands or waterfowl/migratory bird habitat will be incurred from this project.

During the development of the project plan, Freeport LNG sought first to avoid and second to reduce impacts to wetlands. Freeport LNG is committed to mitigating for unavoidable wetland impacts resulting from construction of this facility.

Freeport LNG has investigated several alternatives for mitigation of the wetlands disturbed or filled during construction of the terminal facilities and pipeline. Wetland mitigation opportunities were evaluated using the following order of priority: (1) Onsite, (2) Offsite but on Quintana Island, and (3) Off-Quintana Island but within the same ecosystem type as the project site.

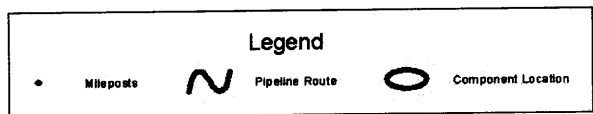
In selecting potential mitigation opportunities, Freeport LNG considered mitigation through on-site wetland creation its main priority. Approximately 5.3 acres of shoreline habitat is available for enhancement at the LNG receiving facility site located along the ICW and an additional 8.8 acres is available within an existing man-made pond located near the proposed marine terminal. The remainder of the Project site is necessary for the LNG facility and unavailable for mitigation.

To determine alternatives that would meet their project-specific requirements for mitigation, Freeport LNG held discussions with the U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department (TPWD). In these discussions, preservation of beach and coastal wetland habitat on Quintana and Follet's Island were listed as being priority items. In public discussions, habitat preservation and enhancement on Quintana Island was a key issue, especially where it applied to resident and migratory bird habitats and coastal wetlands.



Base Map: USGS 1:50,000 Topographic Map, Freeport, Texas and Gulf of Mexico, 1974

3000 0 3000 6000 9000 Feet



Project Area
Proposed Freeport LNG Facility
Brazoria County, Texas

Figure 1

Mitigation Plan Permit # 23078

Freeport LNG identified potential mitigation sites available on Quintana Island, but, upon further consideration, concluded that these sites were incapable of meeting their mitigation goals. No wetland mitigation banks exist in the Brazos River watershed. Capacity does not exist at the Port of Freeport mitigation area south of Freeport. Therefore, off-site mitigation was pursued.

An additional meeting was held with the Corps of Engineers, Galveston District, to discuss other mitigation opportunities. During that meeting, the Corps of Engineers, USFWS, and TPWD identified several potential areas for mitigation. From these, Freeport LNG selected a site on Follets Island for long-term preservation and enhancement as wetland and "wetland buffer" habitat.

Table 1 summarizes proposed on- and off-site mitigation.

Table 1. Summary of Proposed Wetland Mitigation Areas – Freeport LNG Facility, Brazoria County, Texas

Site	Proposed Measures	Overall Mitigation Goals	Acres
1. On-site ICW Shoreline Enhancement	Establish <i>S. alterniflora</i>	Create wildlife habitat and stabilize shorelines	5.3
2. On-site Marine Terminal Area Enhancement	Same as above	Same as above	8.8
3. Off-site Follets Island	Obtain and preserve upland area adjacent to Drum Bay	Preserve and enhance wildlife habitat associated with Drum Bay	19.18 upland 57.57 wetland (numbers from parcel information and need confirmation)

On-Site Shoreline Enhancement

To enhance shoreline habitat at the Project site, Freeport LNG proposes to establish stands of marshhay cordgrass (*Spartina alterniflora*) in two locations for a total of 14.1 acres: one along the ICW and another near the proposed marine terminal (Figures 2 and 3). The primary objective for the proposed mitigation sites is to stabilize shorelines and prevent erosion, however creation of marshlands in these areas also will create and improve habitat for fish and wildlife species.

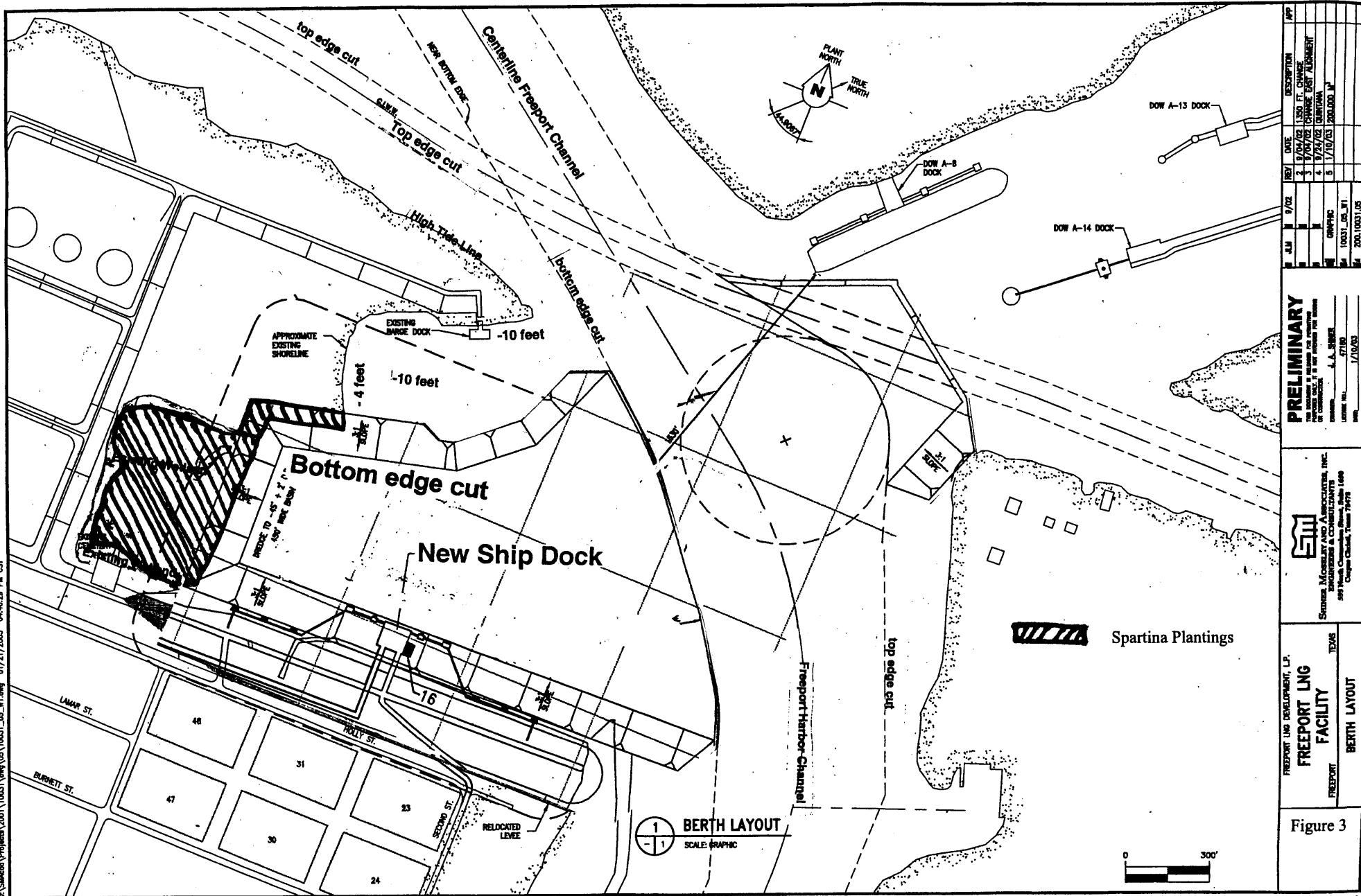
The first of the proposed shoreline enhancement areas is located along the southern edge of the ICW (Figure 1). This area is tidally influenced and shallow, maintaining only a few feet of depth until reaching the dredged portion of the ICW. *S. alterniflora* has been used successfully throughout the Texas and Louisiana Gulf coast for both habitat enhancement and erosion control. The current shoreline at the project site has eroded considerably and substrate within the intertidal area is mostly unvegetated. Establishing a dense stand of cordgrass would greatly improve the functional value of this wetland area.

The second on-site mitigation area is located near the proposed marine terminal. The area consists of a sparsely vegetated, man-made, brackish pond. Construction of the berthing area would require this area to be opened to the ICW, creating opportunity for establishing wetland vegetation within the pond, which currently supports little to no vegetation. In addition, shoreline areas outside of the actual docks and berthing areas will also be planted with *S. alterniflora*.

S. alterniflora will be planted using established methods and from stock to be approved by the Corps of Engineers. Specific performance targets for area and density will be established based on consultations with the Corps of Engineers and as specified in the anticipated 404 permit.

Mitigation Plan Permit # 23078

d:\S:\Microsoft\Projects\2001\10031\dwg\03\10031_06_W1.dwg 01/21/2003 04:40:29 PM CST



REV	DATE	DESCRIPTION	APP
1	9/04/02	150 FT. CHANGE	
2	9/04/02	CHANGE DIST. ALIGNMENT	
3	9/04/02	CHANGE DIST. ALIGNMENT	
4	9/24/02	QUANTITY	
5	1/19/03	200,000 YD	
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			
100			

PRELIMINARY

THIS DOCUMENT IS PRELIMINARY AND NOT FOR CONSTRUCTION.

DATE: 1/19/03

BY: J.A. SINGER

1/19/03



SPENCE, MOSSLEY AND ASSOCIATES, INC.

ENGINEERS & CONSULTANTS

505 South Columbia Street, Suite 1600

Corpus Christi, Texas 78401

FREEPORT LNG DEVELOPMENT, L.P.

FREEPORT LNG FACILITY

TEXAS

FREEPORT

BERTH LAYOUT

Mitigation Plan Permit # 23078

Off-site Mitigation Area

The proposed off-site mitigation area is located on the southern end of Follets Island, adjacent to Drum Bay in Brazoria County, Texas (Figure 4). Follets Island is a barrier island located across San Luis Pass, southwest of Galveston Island (at 29°03' N, 95°10' W). The island faces the Gulf of Mexico to southeast and Drum and Christmas bays to the northwest, protecting the two bays from Gulf storms and tide surges.

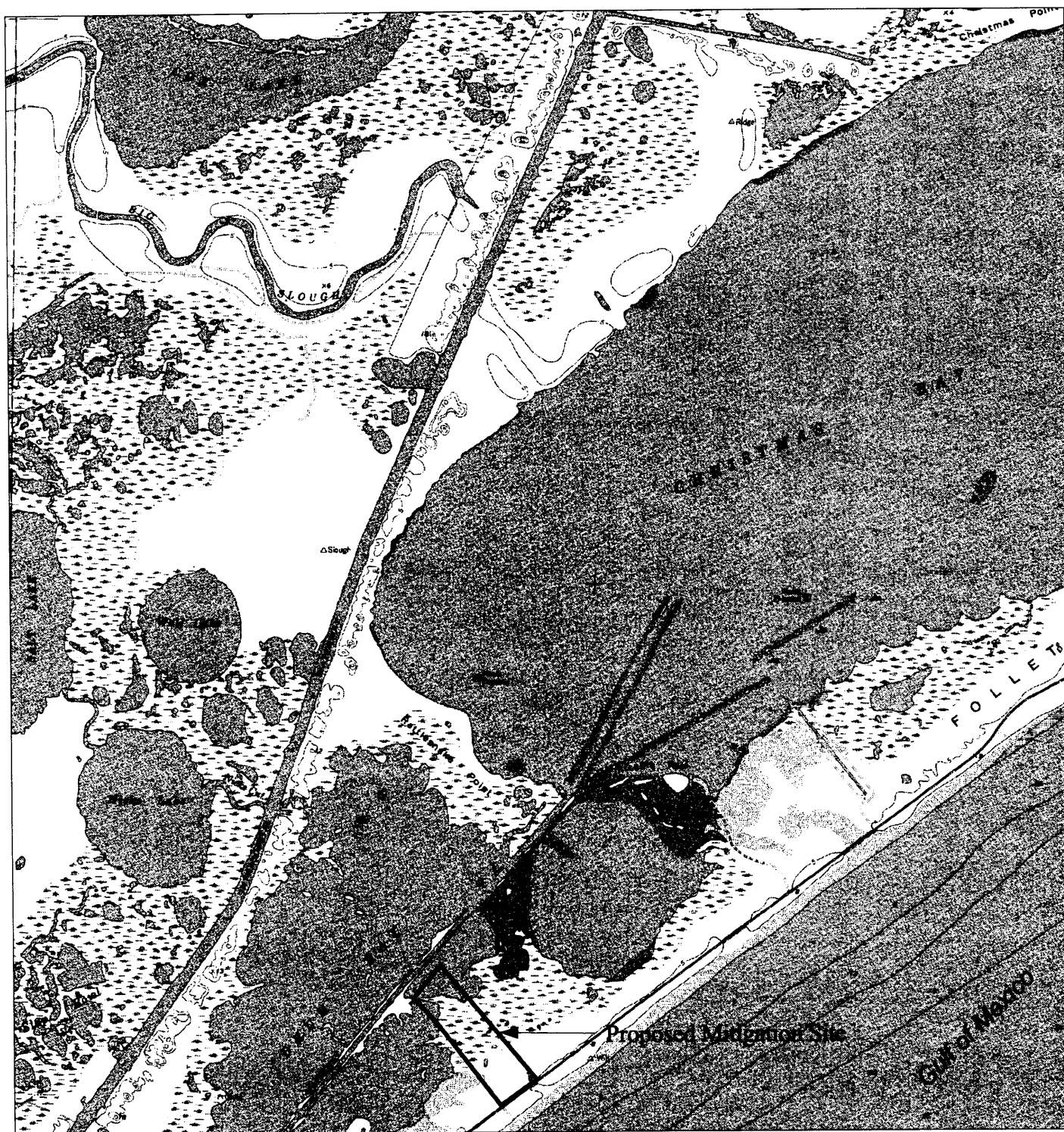
The site is located approximately 12 miles east of the impact area and within the same ecological region. Both areas are within the "Natural Region of Texas" known as the Gulf Prairies and Marshes, as described by Gould (1975). This region is a nearly level plain less than 250 feet in elevation, covering approximately 10 million acres (Hatch et al., 1990).

Soils

Mustang Fine Sand. This soil type occurs in the eastern portion of the proposed mitigation site. Mustang Fine Sand is a nearly level (slopes average about 0.2 percent) non-saline soil that commonly occurs in marshes (Crenwelge et. al. 1981). This soil typically has a four-inch surface layer of mildly alkaline, light brownish-gray fine sand, with underlying layers of saline, moderately alkaline, light gray fine sands (Crenwelge et. al. 1981). These soils are poorly drained, have very slow surface runoff, and are frequently flooded. Permeation is rapid above the water table, which typically occurs at a depth of six to 40 inches. Mustang Fine Sand is most commonly used as rangeland and wildlife habitat; wetness and underlying salinity make these soils unsuitable for crop production (Crenwelge et. al. 1981). Coastal grasses dominate native vegetation typically associated with these soils, with typical plant communities consisting of 30 percent gulf dune paspalum and 20 percent marshhay cordgrass. Woody vegetation and forbs make-up five and 10 percent of the total plant communities, respectively, typically supported by Mustang Fine Sands (Crenwelge et. al. 1981). These soils also provide valuable resting, foraging, and nesting habitat for many species of shore and marshland birds.

Mustang Fine Sand, Saline. Mustang Fine Sand underlies most of the central portion of the proposed mitigation site, between the Mustang Fine Sand and Follet Clay Loam soils. Mustang Fine Sand (saline) is a nearly level (slopes average about 0.2 percent), saline soil that typically occurs on coastal flats and in depressions of marshes (Crenwelge et. al. 1981). Surface layers consist of neutral, saline, fine, gray sands to a depth of about 32 inches; sub-surface layers, to a depth of about 60 inches, consist of neutral, saline, grayish brown fine sands (Crenwelge et. al. 1981). These soils are poorly drained, have very slow surface runoff, and are frequently flooded during abnormally high tides. Permeation is rapid above the water table, which typically occurs at a depth of six to 20

inches. Mustang Fine Sand (saline) is most commonly used as rangeland and wildlife habitat. The wetness, salinity, and flooding during high tides make these soils unsuitable for crop production (Crenwelge et. al. 1981). Native vegetation supported by this soils typically consists of about 90 percent grasses (and grasslike plants) and 10 percent forbs. Dominant plant species include marshhay cordgrass and various rushes and sedges, each accounting for about 25 percent of the total plant community. These soils also support important habitat for a wide variety of birds, including terns and many species of waterfowl (Crenwelge et. al. 1981).



Base Map: U.S.G.S 7.5-minute Topographic Map, Christmas Point, Texas

2000 0 2000 4000 Feet



Figure 4
Proposed Mitigation Site
Freeport LNG Development, L.P.
Brazoria County, Texas

Mitigation Plan Permit # 23078

Follet Clay Loam. This soil type occurs underlies the western portion of the proposed mitigation site, along Drum Bay (Crenwelge et. al. 1981). This is a gray, strongly saline, moderately alkaline clay loam, with yellowish and brownish mottles throughout (Crenwelge et. al. 1981). Typically occurring in marshes that are less than one foot above sea level, Follet Clay Loam is flooded daily during high tide. This soil is nearly level (slopes average about 0.1 percent) and very poorly drained with very slow permeability and surface runoff, such that water stands at or near its surface nearly all year (Crenwelge et. al. 1981). These soils typically support tidal marsh vegetations (i.e., smooth cordgrass, needlegrass rush, saline aster, and maritime saltwort), providing habitat for a variety of birds and marine life. Oysters, crabs, shrimps, and many species of finfish depend on the nutrient-rich marshes supported by these soils (Crenwelge et. al. 1981).

Vegetation

The proposed mitigation site encompasses a variety of coastal habitats. Habitat transitions from upland coastal prairies adjacent to the road to bare tidal flats and estuarine marsh located along the edge of Drum Bay. Although the upland coastal prairie is currently mowed, it consists of vegetation typical of the region, including yellow Indian grass (*Sorghastrum nutans*), gulf cordgrass (*Spartina spartinae*), gulfdune paspalum (*Paspalum monostachyum*), saltgrass (*Distichlis spicata*), Carolina wolfberry (*Lycium carolinianum*), camphor daisy (*Hyplopappus phyllocephala*), sea oxeye (*Borrichia frutescens*), and keygrass (*Monanthochloe littoralis*). Tidal flats consist mostly of bare sands, but also include sparse patches of keygrass (*Monanthochloe littoralis*), saltwort (*Batis maritima*), and glasswort (*Salicornia* sp.). These areas grade into coastal marsh, consisting almost entirely of marshhay cordgrass (*Spartina alterniflora*).

Fisheries and Wildlife

The proposed mitigation site is located in an area that supports a great diversity of fish and wildlife species, including threatened and endangered species and commercially and recreationally valuable fishes. The Christmas Bay complex, which includes Drum Bay, is known to harbor 96 fish species, 68 crustacean species, 140 mollusk species, and numerous other invertebrate animals (McFarlane, 1991). The coastal wetlands of this complex provide an important nursery area for Gulf finfish and shellfish (McFarlane, 1991), including many commercial and recreationally valuable species (i.e., penaeid shrimps, blue crabs, Atlantic croaker, red drum, seatrout, flounder, and menhaden).

Davis and Schmidly (1994, 1997) list 24 species of terrestrial mammals principally occurring in the region. Avifaunal resources are extensive along the upper and lower Texas coasts. Birds along the Texas coast can be divided into resident (non-migratory) and migratory. Texas A&M University (1998) lists 14 amphibian species and 45 species of reptiles as occurring in Brazoria County.

The proposed mitigation site is also located near the Brazoria National Wildlife Refuge, which was established in 1966 to provide quality habitat for migratory waterfowl and

other birds. Mottled ducks, roseate spoonbills, great blue herons, rails, and sandhill cranes have been known to frequent the refuge. The 40,000-acre refuge consists of saline and non-saline prairies, salt and mud flats, fresh and salt marshes, potholes, saltwater lakes, and a freshwater stream. The refuge is located within the Freeport Christmas Bird Count Circle, which achieves the highest number of migratory bird species seen in a 24-hour period in the nation.

The Christmas Bay complex is also known to harbor eight endangered or threatened species, including the bald eagle, brown pelican, peregrine falcon, whooping crane, piping plover, reddish egret, white-faced ibis, and green sea turtle (McFarlane, 1991). Three additional species are known to inhabit the adjacent Brazoria National Wildlife Refuge, including the wood stork, white-tailed hawk, and swallow-tailed kite (McFarlane, 1991). Seven waterbird nesting colonies surround the bay. Preservation of the proposed mitigation site might potentially enhance colonial wading bird productivity by creating an area of sufficient elevation that consists of suitable vegetation and substrates.

Proposed Action Steps and Goals for Off-site Mitigation

Freeport LNG proposes to take the following steps to mitigate for the remaining acres of wetland loss:

- Locate and negotiate the purchase of a tract or tracts sufficiently large to meet the mitigation requirements;
- Obtain a large contiguous tract(s) that would provide adequate habitat preservation and facilitate management;
- Develop a plan and management instrument that will provide for the long-term viability and management of the acquisition (donation to land management agency or private group, conservation easement with conservator, etc.);
- Provide on-going support to aid in the viability of the mitigation tract(s).

The general goal for mitigation at the off-site mitigation area is to preserve and enhance wildlife habitat associated with Drum Bay and the coastal marsh habitats adjacent to the site. This, in turn, will compensate for the loss of wetlands at the project site.

Creation of this mitigation area would compensate for project wetland loss in several ways. First, and primarily, the upland area of the site is currently within an area proposed for residential and/or vacation home development. Development on Follets Island has steadily been moving eastward. The proposed site is on the eastern edge of an area likely to be developed within the next few years. Establishing a mitigation area here would prevent development in wetland buffer areas and extend the currently state-owned and protected lands adjacent to the site. The location of the site adjacent to state-protected land also provides connectivity and increases the value habitat of the site.

Creation of the mitigation area would also reduce current site disturbances. Disturbances include auto and off-road vehicle use and mowing of the upland area by the current owner. Freeport LNG proposes to fence and post the site to reduce such informal uses associated disturbances and to allow the buffer habitat to reestablish itself. Postings could include an interpretive sign describing the purpose of the site and value of coastal wetland habitats and associated uplands.

Freeport LNG does not propose creation of additional wetland habitat, since wetlands are common in the area, while quality upland habitat adjacent to the wetlands is limited and declining due to development. Protection and enhancement of the shoreline area of Drum Bay would increase the value of the existing wetlands by providing wildlife habitat and extending the protected area adjacent to the site. Based on consultations with the Corps of Engineers and others, native vegetation may be planted accelerate and further enhance the habitat value of the site.

Pipeline Mitigation

Informal consultation with the FWS resulted in recommendations that Freeport LNG consider the following be incorporated into the mitigation plan for pipeline construction in EFH.

Freeport LNG will conduct pre-construction surveys of the proposed right-of-way in wetlands to determine pre-project contours, elevations, vegetation types and vegetative cover. This survey will also include aerial photography of the right-of-way and an area 150 feet wide on either side of the right-of-way with a GIS analysis overlay of the ground truthed surveys. The purpose of the additional aerial survey 150 feet outside of the right-of-way is to document existing conditions, in case impacts exceed the area identified as the work corridor.

After construction the pipeline right-of-way, including all vehicle tracks inside and outside the identified work corridor, will be restored to pre-project contours and elevations. The impacted wetlands will also be replanted with appropriate native vegetation on 6-foot centers. A survey of the transplants will be conducted 60 days post-planting to determine percent survival. If 50 percent survival of the transplanted material is not achieved, then a second planting effort will be conducted.

Aerial photography and an elevation survey of the restored right-of-way will be conducted within one month upon completion of restoration activities. This information will be evaluated in a GIS analysis that compares pre-project conditions. Upon completion of the survey, a report detailing the restoration activities and the resulting contours and elevations will be submitted to NOAA Fisheries.

Aerial photography and post-construction elevation and vegetation surveys will also be conducted two years (end of second growing season) after pipeline installation to determine the success of the restoration activities. These surveys will be compared to the

pre-project surveys in a GIS analysis to determine acreage of marsh restored and impacted. If the right-of-way is not restored to pre-project conditions, then either remedial actions or mitigation will be conducted. For areas that are not at suitable elevations, remedial measures to restore the wetlands elevations will be conducted. If practicable remedial measures are not available, then Freeport LNG will mitigate all wetland impacts off site at a 2:1 creation to impact ratio.

Literature Cited

Crenwelge, G.W., J.D. Crout, E.L. Griffin, M.L. Golden, and J.K. Baker. 1981. Soil Survey of Brazoria County, Texas. United States Department of Agriculture, (USDA) Soil Conservation Service; in cooperation with United States Department of Agriculture, Brazoria County Commissioners Court and Texas Agricultural Experiment Station. U.S. Department of Agriculture, Soil Service, Washington, D.C.

McFarlane, R.W. 1991. An Environmental Inventory of the Christmas Bay Coastal Preserve. Galveston Bay National Estuary Program, GBNEP Publication – 7, 75 pp.